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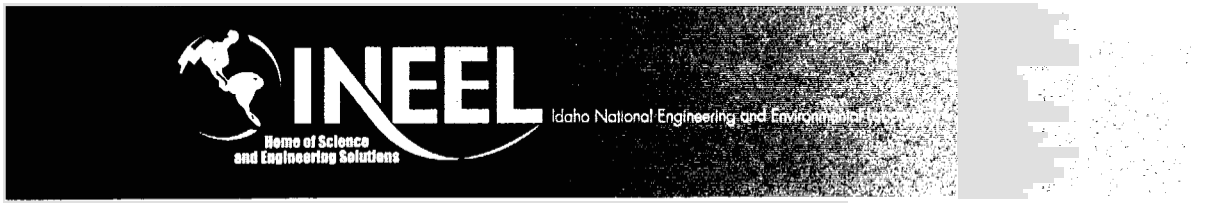
Revision 2
May 2002

U.S. Department of Energy
Idaho Operations Office

Waste Acceptance Criteria for ICDF Landfill



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ABSTRACT

The INEEL CERCLA Disposal Facility landfill will accept Comprehensive Environmental Response, Compensation, and Liability Act wastes generated within the Idaho National Engineering and Environmental Laboratory. Hazardous, mixed, low-level, and Toxic Substance Control Act wastes will be accepted for disposal at the INEEL CERCLA Disposal Facility landfill. The purpose of this Waste Acceptance Criteria document is to provide the basis for the quantities of radioactive and non-radioactive wastes allowable in waste designated for disposal in the INEEL CERCLA Disposal Facility landfill.

The INEEL CERCLA Disposal Facility Complex Waste Acceptance Criteria is the overall Waste Acceptance Criteria. As such, the details of compliance that are the same for all areas of the INEEL CERCLA Disposal Facility Complex are referenced to that document. This INEEL CERCLA Disposal Facility landfill Waste Acceptance Criteria specifies the chemical and radiological Waste Acceptance Criteria for wastes that will be disposed to the landfill. Compliance with the requirements of this INEEL CERCLA Disposal Facility landfill Waste Acceptance Criteria will ensure protection of human health and the environment, including the Snake River Plain Aquifer. Wastes placed in the INEEL CERCLA Disposal Facility landfill must not cause groundwater in the Snake River Plain Aquifer to exceed either maximum contaminant levels, a hazard index of 1, or 10^{-4} cumulative risk levels.

The defined Waste Acceptance Criteria concentrations are compared to the design inventory concentrations. The purpose of this comparison is to show that there is an acceptable uncertainty margin based on the actual constituent concentrations anticipated for disposal at the INEEL CERCLA Disposal Facility.

CONTENTS

TABLES

ACRONYMS

ALARA	as low as reasonably achievable
AOC	area of contamination
ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFC	chlorofluorocarbons
CFR	Code of Federal Regulations
DOE	Department of Energy
DOE-ID	Department of Energy Idaho Operations Office
ELCR	excess lifetime cancer risk
EDF	engineering design file
EPA	Environmental Protection Agency
ER	environmental restoration
GCL	geosynthetic clay liner
HI	hazard index
HDPE	high-density polyethylene
ICDF	INEEL CERCLA Disposal Facility
IDAPA	Idaho Administrative Procedures Act
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LDR	land disposal restriction
MCL	maximum contaminant level
NA	not applicable
NESHAP	National Emission Standard for Hazardous Air Pollutant
NRC	Nuclear Regulatory Commission

O&M	operations and maintenance
OU	operable unit
PCB	polychlorinated biphenyl
PPE	personal protective equipment
RAO	remedial action objectives
RCRA	Resource Conservation and Recovery Act
RD/CWP	remedial design/construction work plan
RDX	Royal Dutch explosives
RI/BRA	remedial investigation/baseline risk assessment
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
SRPA	Snake River Plain Aquifer
SSA	Staging and Storage Annex
SSSTF	Staging, Storage, Sizing, and Treatment Facility
TCLP	toxicity characteristic leaching procedure
TNT	trinitrotoluene
TOC	total organic carbon
TRU	transuranic
TSCA	Toxic Substances Control Act
UHC	underlying hazardous constituent
UTS	universal treatment standards
WAC	Waste Acceptance Criteria
WAF	Waste Approval Form
WAG	waste area group

NOMENCLATURE

The following definitions are presented as an aid to the reader for the understanding of technical and scientific terms used within this document.

Analytical residue and sample preservative residue: Aqueous and organic solutions from sample preservatives and analytical residue generated from field preparation and laboratory analyses.

CERCLA-derived remediation and removal wastes: Wastes from Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) activities that may include, but are not limited to, soil, water, debris, contaminated personal protective equipment (PPE), filters, and other support equipment that cannot be decontaminated.

Construction wastes: Wastes generated during the on-Site construction of CERCLA activities.

Contaminated equipment: Contaminated equipment becomes a waste stream if it cannot be properly decontaminated or reused.

Debris: Solid material exceeding a 60-millimeter (mm) particle size that is a manufactured object, plant, or animal matter, or natural geologic material intended for disposal. However, the following materials are not considered to be debris:

- Any material for which a specific treatment standard is provided in Subpart D of 40 Code of Federal Regulations 268, such as lead acid batteries, cadmium batteries, and radioactive lead solids
- Process residuals, such as smelter slag and residues from the treatment of waste, wastewater, sludge, or air emission residues
- Intact containers of hazardous waste that retain at least 75% of their original volume.

A mixture of debris and other material that has not been treated to the standards provided by 40 Code of Federal Regulations 268.45 is subject to regulation as debris, if the mixture is composed primarily of debris, by volume, based on visual inspection.

Drill cuttings: Soil generated from boring and drilling activities. Perched water and Snake River Plain Aquifer (SRPA) water well installation is expected to generate a substantial volume of drill cuttings.

Free liquids: Liquids that can be readily separated from the solid portion of a waste under ambient temperature and pressure (DOE Order 435.1), as demonstrated by "Environmental Protection Agency Paint Filter Liquids Test Method 9095."

Hazardous debris: Debris that contains a hazardous waste listed in Subpart D of 40 Code of Federal Regulations 261, or that exhibits a characteristic of hazardous waste identified in Subpart C of 40 Code of Federal Regulations 261.

Hazard index: The sum of more than one hazard quotient where the Environmental Protection Agency (EPA) goal is a value not to exceed 1.

Hazard quotient: The ratio of a single substance exposure level, over a given time period, to a reference exposure level at which no adverse effects are likely to occur.

Hazardous substances: Any material designated as such pursuant to CERCLA, including all Resource Conservation and Recovery Act (RCRA) hazardous wastes, radionuclides, a variety of other chemical substances, and any material identified as a hazardous substance, such as petroleum, petroleum products, and all hazardous wastes.

Hazardous waste: Waste designated as hazardous by EPA regulations (40 Code of Federal Regulations 261.3) and regulated under RCRA.

High-level waste: Highly radioactive waste material. High-level waste results from the reprocessing of spent nuclear fuel, including the liquid waste produced directly during reprocessing. As per DOE Order 435.1, the term refers to any solid material derived from such liquid waste that contains fission products in sufficient concentrations, and to other highly radioactive material that is determined, consistent with existing law, to require permanent isolation. (Adapted from: Nuclear Waste Policy Act of 1982, as amended.)

Hydraulic spills: Unintentional releases of hydraulic fluid. Spills that occur when hydraulic fluid leaks from equipment seals or through ruptured hoses.

Investigation-derived waste: Materials that are generated from CERCLA investigations, such as drill cuttings, purge water, development water, overburden, interstitial and underburden soils, and wastes (debris, sludge, etc.).

Infectious waste: Waste containing living organisms that could endanger human health or the health of domestic animals or wildlife by extending the range of biological pests, viruses, pathogenic microorganisms, or other agents capable of infesting, infecting, or extensively and permanently altering the normal populations of organisms.

Low-level radioactive waste: Waste that cannot be defined as high-level radioactive waste, spent nuclear fuel, transuranic (TRU) waste, by-product material (as defined in Section 11e. [2] of the Atomic Energy Act of 1954, as amended), or naturally occurring radioactive material (DOE Order 435.1).

Miscellaneous waste: Non-recyclable, unwanted material, such as trash, labels, rags, and other debris.

Mixed waste: Waste containing both radioactive components as defined by the Atomic Energy Act of 1954 (as amended), and hazardous components as defined by 40 Code of Federal Regulations 262.

Personal protective equipment: Items worn or used during waste-handling activities such as coveralls, shoe covers, boots, gloves, glove liners, hoods, and duct tape. Coveralls and hoods are generally made of cloth, paper, or synthetic material. Gloves are generally latex or nitrile, and glove liners are made of disposable cloth material. Shoe covers and boots are generally rubber.

Purge/development water: Water generated from well development or during sampling that is removed from a well before samples are collected.

Radioactive waste: Solid, liquid, or gaseous material that contains radionuclides regulated under the Atomic Energy Act of 1954 (as amended), which is of negligible economic value considering costs of recovery.

RCRA Facility means:

1. All contiguous land, structures, other appurtenances, and improvements on the land, used for treating, storing, or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units (e.g., one or more landfills, surface impoundments, or combinations of them).

2. For the purpose of implementing corrective action under 40 CFR 264.101, all contiguous property under the control of the owner or operator seeking a permit under Subtitle C of RCRA. This definition also applies to facilities implementing corrective action under RCRA Section 30008(h).

3. Notwithstanding paragraph (2) of this definition, a remediation waste management site is not a facility that is subject to 40 CFR 264.101, but is subject to corrective action requirements if the site is located within such a facility.

Sample containers: Vessels composed of steel, aluminum, Teflon, brass, glass, or plastic used to contain samples of water, soil, or other media. Once used, these containers become a waste stream if they cannot be decontaminated for reuse.

Secondary waste: A generic category of wastes that are generated from support activities (including operations and maintenance [O&M] activities) related to retrieving, processing, and packaging the investigation-derived materials. Examples of secondary wastes include waste associated with routine decontamination activities (excluding facility closure), PPE, administrative area and support services wastes, used equipment and filters, and other similar wastes generated during O&M activities.

Soil waste: Soils excavated as part of a project that may be contaminated as a result of spill and pipeline leaks or radioactive liquids from plant liquid transfer operations.

Solidification: A technique that limits the solubility and mobility of hazardous waste constituents through physical means. This process changes the physical state from liquid or semi-solid to a solid.

Spent nuclear fuel: Fuel that has been withdrawn from a nuclear reactor following irradiation and that has not yet been reprocessed to remove its constituent elements.

Stabilization: A technique that limits the solubility and mobility of hazardous waste constituents by causing the constituents to bond or chemically react with the stabilizing material.

Structural stability: A waste form that will generally maintain its physical dimensions and its form under the expected disposal conditions, such as weight of overburden and compaction equipment, the presence of moisture and microbial activity, and internal factors such as radiation effects and chemical changes. The waste form itself can provide structural stability by processing the waste to a stable form or by placing the waste in a disposal container or structure that provides stability after disposal.

Toxic Substances Control Act (TSCA) waste: Waste managed strictly under TSCA regulations. Currently, only polychlorinated biphenyls (PCBs) and asbestos are regulated under TSCA as waste.

Transuranic (TRU) waste: Per DOE Order 435.1, radioactive waste containing more than 100 nanocuries (3,700 becquerels) of alpha-emitting TRU isotopes per gram of waste, with half-lives greater than 20 years, except for (1) high-level radioactive waste; (2) waste that the Secretary of Energy has determined, with the concurrence of the administrator of EPA, does not need the degree of isolation required by the 40 Code of Federal Regulations Part 191 disposal regulations; or (3) waste that the

Nuclear Regulatory Commission (NRC) has approved for disposal on a case-by-case basis in accordance with 10 Code of Federal Regulations Part 61. (Source: Waste Isolation Pilot Plant Land Withdrawal Act of 1992, as amended.)

Unused and unaltered sample material: Material that may include excess soil cores from the interbeds, underlying basalt, and groundwater.

Void space: *Compressible void space*: Space that is compressible through the application of load or settlement over time (for example, interstitial space in soils, empty space in wooden boxes of soils, etc.). *Incompressible void space*: Percent of voids in waste that is encased in a cement enclosure (for example, void space within a container that has been filled with concrete).

Waste Acceptance Criteria for the ICDF Landfill

1. INTRODUCTION

The U.S. Department of Energy Idaho Operations Office (DOE-ID) authorized a remedial design/construction work plan (RD/CWP) for the Idaho Nuclear Technology and Engineering Center (INTEC) in accordance with the Waste Area Group (WAG) 3, Operable Unit (OU) 3-13 Record of Decision (ROD) (DOE-ID 1999). The ROD requires the removal and on-Site disposal of some of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remediation wastes generated within the boundaries of the Idaho National Engineering and Environmental Laboratory (INEEL).

The ROD requirements necessitate the construction of the INEEL CERCLA Disposal Facility (ICDF), which will be the disposal facility for the ROD-identified waste streams. The ICDF landfill will be an on-Site, engineered facility, located south of INTEC and adjacent to the existing percolation ponds, that meets the substantive requirements of Resource Conservation and Recovery Act (RCRA) Subtitle C, Idaho Hazardous Waste Management Act, DOE Order 435.1, and Toxic Substances Control Act (TSCA) PCB landfill design and construction requirements. Designed and authorized to accept not only Waste Area Group (WAG) 3 wastes, but also wastes from other INEEL CERCLA actions, the ICDF Complex will include the necessary subsystems and support facilities to provide a complete waste disposal system.

The major components of the ICDF Complex include the following:

- The disposal cells (landfill)
- An evaporation pond comprised of two cells
- The Staging, Storage, Sizing, and Treatment Facility (SSSTF).

The ICDF Complex, including a buffer zone, will cover approximately 40 acres, with a landfill disposal capacity of approximately 510,000 yd^3. The evaporation pond, designated as equivalent to a RCRA Corrective Action Management Unit in the OU 3-13 ROD, will receive ICDF leachate, and other aqueous wastes generated as a result of operations. Other aqueous waste generated by INEEL CERCLA projects that has an approved Waste Approval Form (WAF) may also be accepted. The landfill will also accept decontamination water and water from CERCLA-generated well purging, sampling, and well development activities along with other INEEL CERCLA aqueous waste. The ICDF leachate will be pumped directly to the evaporation pond and the pump system will track the volume and flow of leachate sent to the pond.

The ICDF Complex will be designed to provide the centralized receiving, inspection, treatment, and segregation areas necessary to stage and store incoming waste from the other INEEL CERCLA remediation sites prior to disposal to the ICDF landfill or shipment off-Site. All ICDF Complex activities shall take place within the WAG 3 area of contamination (AOC) to allow flexibility in managing the consolidation and remediation of wastes without triggering land disposal restrictions (LDRs) and other RCRA requirements, in accordance with the OU 3-13 ROD, although LDRs will apply to waste generated outside the WAG 3 AOC or to those wastes that have triggered placement. Figure 1-1 illustrates the WAG 3 AOC.

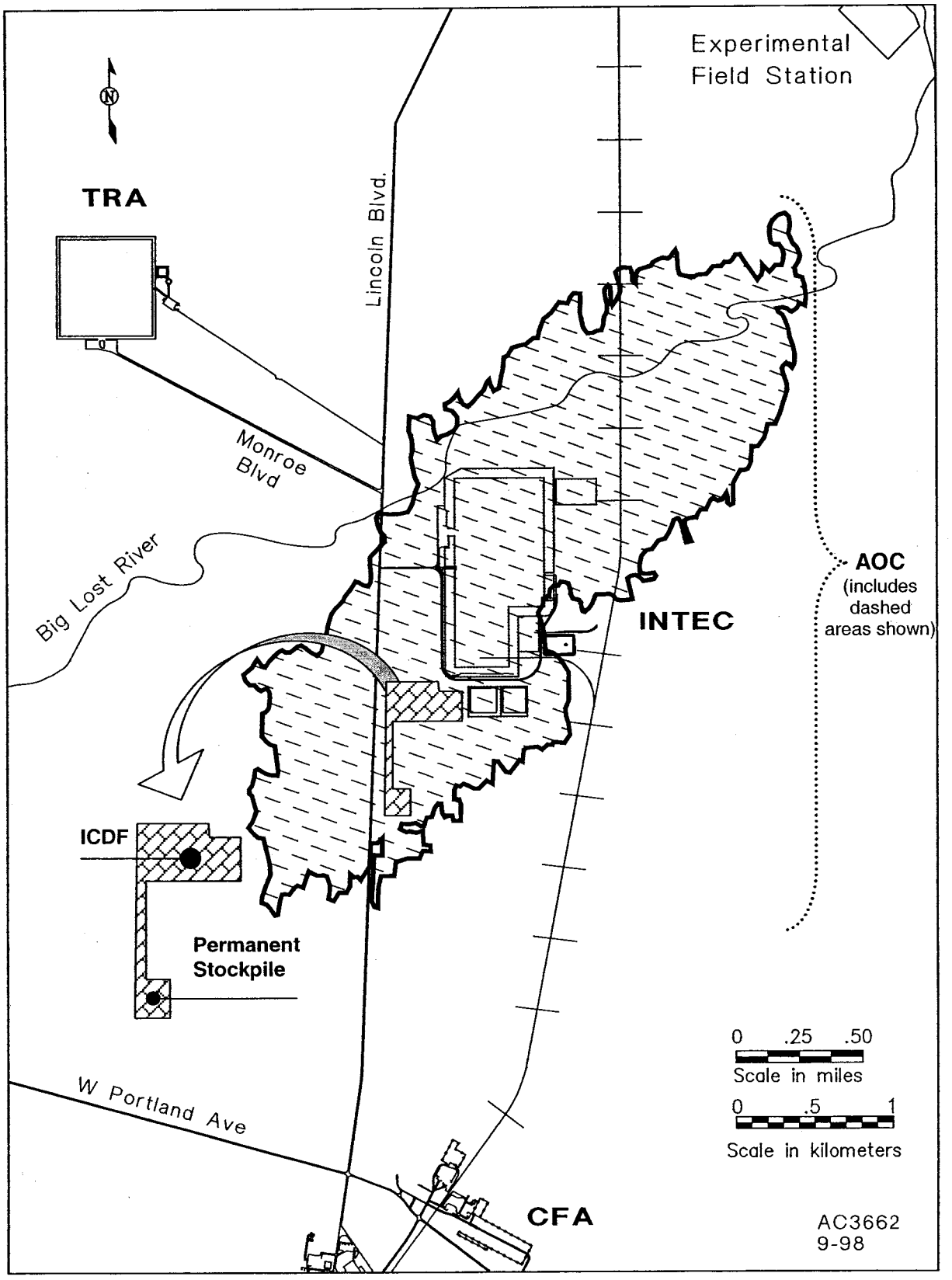

Figure 1-1. WAG 3 area of concern.

A short-term storage area, the Staging and Storage Area (SSA), is already located within the INTEC fenced area to serve as a temporary storage area for INEEL CERCLA waste designated for:

- Direct disposal to the ICDF landfill
- Packaging in preparation for off-Site disposal
- Other INEEL on-Site disposal.

Wastes from WAG 3 and other CERCLA remediation sites will be stored at the SSA during the design and construction phases of the ICDF Complex, including the construction of the SSSTF.

The ICDF landfill will accept only low-level, mixed low-level, hazardous, and TSCA wastes generated from INEEL CERCLA activities for disposal. Current projections of site-wide CERCLA waste volumes total about 510,000 yd^3. Most of the waste will be contaminated soil, but debris and CERCLA investigation-derived waste are also included in the waste inventory.

This document details the criteria that must be satisfied prior to the ICDF landfill acceptance of waste for disposal. Compliance with the ICDF landfill Waste Acceptance Criteria (WAC) will ensure protection of human health and the environment, including the Snake River Plain Aquifer (SRPA). Wastes placed in the ICDF landfill must not cause groundwater in the SRPA to exceed Idaho maximum contaminant levels (MCLs), 10^{-4} cumulative risk levels, or a hazard index (HI) of 1. Exposure to members of the public has been evaluated for two scenarios: as visitors to the ICDF Complex who have had appropriate health and safety training and on-Site briefing, and as visitors to the Central Facilities Area (CFA) (e.g., delivery services with no special training).

Three WACs have been developed for the ICDF Complex: the ICDF Complex WAC (which is the main WAC for the complex) and two secondary WACs for the ICDF landfill and ICDF evaporation pond, as described below:

- The *ICDF Complex Waste Acceptance Criteria* (ICDF Complex WAC) (2002a) is the master WAC for all wastes entering the ICDF Complex for treatment, storage, disposal, or packaging for off-Site shipment. All incoming wastes must have adequate documentation to demonstrate that they meet the appropriate WAC for units within the ICDF Complex. If the waste is to be shipped off-Site, the waste should meet the WAC for the final disposal facility. This ICDF Complex WAC will allow the waste to enter the ICDF Complex, but if the waste is destined for the landfill, or evaporation pond, the corresponding secondary WACs must also be met.

- This ICDF landfill WAC is a secondary WAC specific to wastes that will be disposed in the ICDF landfill. Landfill-specific acceptance criteria (e.g., numerical chemical and radiological concentrations) have been developed for the landfill and are included in this WAC. Development of the chemical and radiological acceptance criteria for the landfill included calculations to determine concentrations in the ICDF landfill leachate that are protective of the evaporation pond liner system, SRPA, and human health and the environment. Generic criteria that must be met by all wastes entering the ICDF Complex gates are referenced to specific sections of the ICDF Complex WAC.

- The *Waste Acceptance Criteria for the ICDF Evaporation Pond* (ICDF Evaporation Pond WAC) (DOE-ID 2002b) is a secondary WAC specific to wastes that will be disposed to the ICDF evaporation pond. Evaporation pond-specific acceptance criteria (e.g., numerical chemical and radiological concentrations) have been developed for the pond and are included in the evaporation

pond WAC. Development of the chemical and radiological acceptance criteria for the landfill included calculations to determine concentrations in the ICDF landfill leachate that are protective of the evaporation pond liner system, human health, and potential ecological receptors. Generic criteria that must be met by all wastes entering the ICDF Complex gates are referenced to specific sections of the ICDF Complex WAC.

1.1 Purpose and Objectives

The purpose of this WAC document is to provide the limits for the quantities of radioactive and non-radioactive constituents that may be accepted for disposal at the ICDF landfill. The objectives of the ICDF landfill WAC are to ensure the following:

- Waste placed within the ICDF landfill will not exceed the allowable limits for the protection of the SRPA per the OU 3-13 ROD (DOE-ID 1999) requirements.
- The commitments in the OU 3-13 ROD (DOE-ID 1999) to meet the remedial action objectives (RAOs) are met and maintained.
- The waste received at the ICDF landfill contains only the radionuclides and hazardous constituents that the facility can safely manage to protect human health (workers and the public) and the environment.
- The concentrations and/or total activities of the waste received at the ICDF landfill are compatible with the ICDF landfill design and operations.
- The waste received at the ICDF landfill is in a form or container that will maintain its integrity and retain acceptable configuration under the conditions expected to be encountered during ICDF Complex operations and closure.
- Waste received at the ICDF landfill does not contain materials that will compromise the safety or integrity of the facility under the expected operating conditions. For example, waste with significant voids could compromise the cover integrity due to subsidence, reactive wastes could compromise worker safety, and liner-incompatible wastes could compromise liner integrity.

1.2 Scope

Landfill-specific acceptance criteria (e.g., numerical chemical and radiological concentrations) have been developed for the landfill and are included in this WAC. Development of the chemical and radiological acceptance criteria for the landfill included calculations to determine concentrations in the ICDF landfill leachate that are protective of the evaporation pond liner system, SRPA, and human health and the environment. Generic criteria that must be met by all wastes entering the ICDF Complex gates are referenced to specific sections of the ICDF Complex WAC.

The ICDF Complex, including the ICDF landfill cells, will be designed to meet the substantive requirements of DOE Order 435.1, RCRA Subtitle C minimum technology requirements (40 Code of Federal Regulations [CRF] 264 Subpart N requirements), and the applicable sections of TSCA PCB design and construction specifications. The ICDF landfill is designed and managed to meet the National Contingency Plan requirement of maximum 15 mrem/yr exposure to the public. The ICDF landfill will be authorized to accept wastes generated within the INEEL from CERCLA removal/remedial and investigative activities at the INEEL WAGs.

The ICDF landfill is designed and designated to accept ICDF CERCLA remediation waste generated within the ICDF Complex and from CERCLA removal/remedial and investigative activities at the INEEL WAGs that meet the ICDF landfill WAC for disposal.

The ICDF Complex users must specify and obtain approval from the ICDF Complex Operations Manager prior to shipment. Wastes that can be accepted at the ICDF landfill include the following:

- WAG 3 CERCLA Remediation Wastes, including soils, drill cuttings, building debris, boxed soils, and secondary remediation wastes, such as PPE.
- Wastes generated in the ICDF Complex and from CERCLA investigative, remedial, and removal activities at the INEEL WAGs. These wastes will include soils, drill cuttings, building debris, stabilized wastes, and secondary remediation and investigation wastes.
- Secondary CERCLA wastes from waste processing and decontamination activities in the SSSTF and INEEL WAGs.

1.3 Roadmap to ICDF Landfill WAC

Primary elements of the ICDF landfill WAC that are common to the ICDF Complex WAC (DOE-ID 2002a) are cross-referenced in Table 1-1. Requirements that apply only to the ICDF landfill are included in this ICDF landfill WAC and are not repeated in the ICDF Complex WAC.

Table 1-1. Cross-reference of ICDF Complex WAC and ICDF Evaporation Pond WAC.

Function	ICDF Complex WAC Section
Responsibilities	1.5
General requirements of the waste profile process	2.1
Exceptions to WAC requirements (case-by-case acceptance)	2.2.1
General classes of waste	2.2
Waste form requirements	2.2
Composition and waste containers	2.3
Physical and chemical characterization requirements	2.4
Type of acceptable knowledge	2.4.1
Radiological characterization	2.5
Waste acceptance process	3
Waste acceptance scheduling requirements	3.2
Waste tracking system	3.3
Data quality objectives	3.4
Waste profile	3.5
Waste certification process	3.6
Verification as packaged	3.7
Receipt verification	3.8
Non-conforming waste	3.9
Records	3.10

Table 1-1. (continued).

Function	ICDF Complex WAC Section
Packaging and shipping	3.11
Prohibitions	5.2
Criticality safety limits	5.4.3
Package external concentration limits	5.4.4
Package dose rate limits	5.4.5
Packaging criteria	5.5
Outer package criteria	5.5.1
Container requirements	5.5
Condition of containers	5.5.2
Container compatibility and segregation	5.5.3
Securing waste and shielding	5.5.4
Handling packages	5.5.5
Package labeling and marking	5.5.6

1.4 Relationship to Other Documents

This ICDF landfill WAC is based on and integrated with several related documents, as discussed below.

1.4.1 OU 3-13 Record of Decision

The OU 3-13 ROD (DOE-ID 1999) is the regulatory authorization for the ICDF Complex. This document includes the regulatory basis for the ICDF landfill, and the applicable or relevant and appropriate requirements (ARARs) that the ICDF Complex must meet. The OU 3-13 ROD also describes the AOC for WAG 3. Because the ICDF Complex will receive waste from both inside and outside of the AOC, this WAC has different requirements for mixed waste from inside and outside of the AOC. These AOC issues are addressed in more detail in the WAC Basis (Section 4.1).

1.4.2 Related ICDF Complex WACs

When the ICDF Complex becomes operational, the three integrated WACs will actively govern the requirements of the acceptance and disposal process. These WACs are briefly described below:

- **ICDF Complex WAC:** The ICDF Complex WAC will encompass all waste entering the ICDF Complex, including waste for landfill disposal, evaporation pond disposal, or for storage or off-Site shipment. Wastes meeting the ICDF Complex WAC must demonstrate that they meet the ICDF Landfill WAC in order to be accepted for disposal in the ICDF landfill, and must meet the evaporation pond WAC to be accepted for disposal to the pond. The ICDF Complex WAC contains the WAC components that apply to all wastes, regardless of the intended final disposal.

- **ICDF Landfill WAC:** This WAC specifies the chemical and radiological requirements for the disposal of waste in the ICDF landfill.

- **ICDF Evaporation Pond WAC:** The ICDF Evaporation Pond WAC specifies the chemical and radiological requirements for disposal of waste in the ICDF evaporation pond.

Integration between the various WACs will be achieved, by use of the ICDF Complex WAC as the master document, and through the use of the same waste profile for all wastes entering the complex. The waste profile will help provide consistent documentation of the waste during shipment or transfer, and will be the same no matter the waste destination.

1.5 Responsibilities

Responsibilities for use of the ICDF Complex are described in the ICDF Complex WAC, Section 1.5 (DOE-ID 2002a).

2. WASTE PROFILE PROCESS

The waste profile process is described in Section 2 of the *ICDF Complex Waste Acceptance Criteria* (DOE-ID 2002a).

3. WASTE ACCEPTANCE PROCESS

The waste acceptance process is described in Section 3 of the *ICDF Complex Waste Acceptance Criteria* (DOE-ID 2002a).

4. WASTE ACCEPTANCE BASIS

4.1 Criteria Basis

The ICDF landfill is authorized to accept CERCLA waste from INEEL activities consistent with the OU 3-13 ROD (DOE-ID 1999). This section develops the basis for the ICDF Complex WAC numerical criteria. The actual numerical criteria are presented in Section 5. The basis for acceptance criteria includes protection of human health including worker health and safety and the environment, protection of the ICDF landfill liner system, control of waste form, compliance with environmental regulations ARARs as authorized by the OU 3-13 ROD. These criteria have provided the basis for development of a chemical, radiological, and physical WAC.

4.1.1 Remedial Design Analysis

The WAC is based on the constituents identified in the Design Basis Inventory (EDF-ER-264) and the results of the studies summarized in Table 4-1.

Table 4-1. Summary of ICDF study results influencing the ICDF WAC.

Document	Summary of results
"Leachate/Contaminant Reduction Time Study" (EDF-ER-274)	This study provides the content of a hypothetical ICDF leachate based on the Design Basis Inventory (EDF-ER-264). It provides the modeled composition of the leachate during the operations period, taking into account solubility, soil-water partitioning, and radioactive decay, using a combination of K_d s and geochemistry modeling. An operational period of 15 years was assumed for the ICDF landfill, followed by a 30-year post-closure period.
"Fate and Transport Modeling Results" (EDF-ER-275)	This study estimated contaminant fate and transport (1,000,000-year simulations) through the vadose zone to a monitoring well located 20 meters (m) downgradient of the ICDF landfill in the SRPA.
"Waste-Soil Design Ratio Calculations" (EDF-ER-277)	These calculations were performed for various types of solid debris varying from rubble to cement monoliths. The soil/waste ratio depends on the size and the shape of the non-soil waste and varies from 2:1 to 42:1.
"Hydrologic Modeling of Final Cover" (EDF-ER-279)	The model was used to evaluate long-term infiltration rates through the landfill cover section for the ICDF landfill.
"Liner/Leachate Compatibility Study" (EDF-ER-278)	This study develops the maximum concentrations allowable in the waste in terms of impact to the landfill liner. These are compared to the design inventory. The study indicates that the main chemical threat to the ICDF landfill liner would be organic constituents. Organic constituents would have to be present at concentrations several orders of magnitude higher than the Design Basis Inventory (EDF-ER-264) organic constituents before they would impact liner compatibility.
IDAPA Preliminary Air Screening Results (EDF-ER-315)	This study calculates preliminary air compliance results based on IDAPA 58.01.01.585/586. These calculated concentrations are compared with the regulatory values to determine if further detailed modeling is required to establish operational controls. The study assumes that the maximum input for one year is approximately 36 percent of the design inventory and compares both the anticipated design inventory waste concentrations and the WAC concentration guideline waste concentrations to the regulatory limits. Results show that for design inventory waste concentrations, only benzo(a)pyrene exceeded regulatory limits. Results show that for WAC guidance concentrations, 80 chemicals exceed regulatory limits. The operational limits for air emissions will be set in the RAWP.

4.1.2 Protection of Human Health and the Environment

Worker protection shall be provided by compliance with the requirements of the site-specific health and safety program for the ICDF Complex operations (INEEL 2001).

The waste handling at the ICDF landfill shall maintain worker exposure as low as reasonably achievable (ALARA), in accordance with DOE Order 5400.5. Therefore, risks to workers have not limited allowable WAC concentrations, but standard DOE protocol will limit worker exposures to ensure worker protection. The primary long-term routes of exposure to hazardous constituents and the radionuclides that are of concern after placement of waste in the ICDF landfill include the ingestion of contaminated groundwater or intrusion into the waste. This is discussed in more detail in "Landfill Risk Assessment for Workers" (EDF-ER-327). RAOs for the SRPA relating to the ICDF landfill as stated in the OU 3-13 ROD (DOE-ID 1999, page 8-2) are defined as follows:

> "Maintain caps placed over contaminated soil or debris areas that are contained in place and the closed ICDF-complex, to prevent the release of leachate to underlying groundwater which would result in exceeding a cumulative carcinogenic risk of 1×10^{-4}, a total HI of 1, or applicable State of Idaho groundwater quality standards (for example, MCLs) in the SRPA."

RAOs for the ICDF Complex relating to intrusion (DOE-ID 1999, page 8-3) are defined as follows:

> "Maintain the closed and capped ICDF Complex to prevent exposure to the public to a cumulative carcinogenic risk of 1x10-4 and a total HI of 1."

Appendix A summarizes the development of the WAC for specific radionuclide and chemical constituents, which was based on evaluation of risk via the groundwater ingestion pathway.

4.1.3 Protection of the ICDF Landfill Liner System

The expected leachate concentrations are compatible with the earthen and synthetic materials proposed for the ICDF landfill and evaporation liner systems based on EPA Method 9090 compatibility tests performed at similar facilities and manufacturers' recommendations. The manufacturers' compatibility data and published compatibility tests were reviewed to suggest ICDF maximum leachate limits for liner compatibility. The Method 9090 tests and manufacturers' recommendations were established at levels that had no impact to earthen and synthetic materials. These leachate limits were used to determine the maximum allowable waste soil concentrations of organic and inorganic constituents that, if placed in the ICDF landfill, would not cause significant degradation of the liner system. Based on the results of the study, hazardous constituent concentration limits necessary to ensure liner integrity are listed in "Liner/Leachate Compatibility Study" (EDF-ER-278) and are included as Appendix B of this document.

The constituents used in the published studies are in similar chemical groups as the constituents in the ICDF design inventory and, therefore, would react similarly with the liner materials. Moreover, the use of general chemical categories rather than individual constituents provides a worst-case scenario because of possible synergistic effects of mixed compounds. As such, the liner compatibility evaluations have adequately addressed the wide range of constituents anticipated for disposal at the landfill.

Table 4-2 provides the recommended maximum concentration of chemical categories that, if in the landfill leachate, may be incompatible with the polymeric or earthen material comprising the ICDF liner system. These limits are based on review of the published liner compatibility studies and manufacturers'

recommendations. Where available, the recommended maximum allowable concentrations with regard to liner compatibility for individual constituents are provided in Appendix B. For comparison, a category has been included in Table 4-2 to present the projected maximum concentrations in leachate generated from the design inventory. To the extent possible, incompatible wastes will not be placed close to each other in the landfill.

Table 4-2. Maximum allowable concentrations in leachate by chemical category for liner compatibility.

Chemical Category	Compatible Concentration for high-density polyethylene (HDPE)	Compatible Concentration for GCL and Clay	Recommended ICDF Maximum Concentration	Design Inventory Concentrations
Organics	500,000[a] mg/L	500,000[b] mg/L	500,000 mg/L	47 mg/L
Acids and bases	750,000[a] mg/L	500,000[b] mg/L	500,000 mg/L	0[c]
Inorganic	500,000[a] mg/L	500,000[b] mg/L	500,000 mg/L	46,000 mg/L
Dissolved salts	No limit	35,000 mg/L	35,000 mg/L	8,000 mg/L
Strong oxidizers	1,000 mg/L	62,500 mg/L	1,000 mg/L	0[c]
Radionuclides	1,000,000[b] rads	No limit[d]	1,000,000 rads	17,000 rads
pH	0.5-13.0[a]	0.5-13.0	0.5-13.0	8.0

a. Based on the manufacturers' maximum concentration of the list of constituents tested by the manufacturers. The manufacturers' recommendations are provided in Appendix B.

b. Based on reported literature values.

c. Strong acids, bases, or oxidizing compounds were not reported in the design inventory.

d. "No limit" indicates a capacity for pure product that will not adversely affect the liner.

The concentration and exposure limits in Table 4-2 provide WAC for chemical categories with regard to liner compatibility. These values can be used as a general guide to determine the WAC if individual constituents in the leachate are lower than the limits provided in Appendix B. Based on the design inventory there are no liner compatibility issues for waste identified to be disposed in the landfill.

If necessary during operations, the ICDF landfill management and operations team will evaluate waste with chemical constituents not listed in this section on a case-by-case basis. The evaluation will consist of a paper study showing that the new waste constituents are chemically equivalent to an approved constituent. If chemical equivalency cannot be determined through a paper study, EPA Method 9090 (EPA 1986) may be required to show that leachate from the proposed waste is compatible with the liner material. The results of the case-by-case analysis will be documented and retained at the ICDF Complex. Regulatory review of these case-by-case analyses will be through approval of the waste approval forms

The manufacturer for the ICDF geomembrane recommends that leachate have a pH between 0.5 and 13 pH units. Recommended manufacturers' limits for strong oxidizers are 1,000 to 500,000 mg/L and metals, salts, and nutrients of 500,000 mg/L. The permeability of the bentonite used in the GCL and soil bentonite liner (SBL) may increase if permeated with leachate having a salt ion concentration. Therefore, a maximum inorganic salt concentration of 35,000 mg/L is recommended as a conservative upper limit. These limits are far above the concentrations expected in the leachate from the ICDF landfill and were used to determine the maximum allowable concentrations in the waste soil that if placed in the ICDF landfill would not cause significant degradation of the liner system.

4.1.4 Compliance with ARARs

The ICDF Complex is a part of a CERCLA Remedial Action, and the ARARs are clearly identified in the OU 3-13 ROD. Compliance with these ARARs is documented in the ARARs Compliance Table for the ICDF Complex, which is found in the *INEEL CERCLA Disposal Facility Remedial Design/Construction Work Plan*, (DOE-ID 2002c). Specific prohibited wastes are discussed in Section 5.1 of this document. ARARs that effect the WAC are those that limit what types of waste and concentrations/activities are allowed to enter the landfill. The specific ARARs that impact the WAC for various constituents are discussed below.

4.1.4.1 Hazardous Waste. Wastes not subject to LDRs and originating inside the WAG 3 AOC (that have not triggered placement) are acceptable for direct disposal in the ICDF landfill without the need to meet the RCRA LDRs specified in the OU 3-13 ROD (DOE-ID 1999) provided that the waste meets the appropriate WAC.

Hazardous waste from outside the WAG 3 AOC, or hazardous waste from inside the WAG 3 AOC that has triggered placement, is prohibited from disposal at the ICDF landfill unless it meets RCRA LDRs of 40 CFR 268, 40 CFR 268.45 (Treatment Standards for Hazardous Debris), or 40 CFR 268.49 (Alternative LDR Standards for Contaminated Soil). These limits are given in Table 4-3. Hazardous waste is defined in 40 CFR 261 Subparts C and D of the RCRA. The ICDF landfill cannot accept D-code characteristic waste, F-listed wastes, and most P-code and U-code wastes from outside the WAG 3 AOC, or wastes that have triggered placement that are above LDR requirements.

4.1.4.2 Outside of AOC Wastes and AOC Wastes that Have Triggered Placement. Wastes originating from outside the AOC or that have triggered placement must comply with RCRA ARARs for land disposal. ICDF Complex users shall determine whether waste is subject to RCRA LDRs by completing a hazardous waste determination. If the waste is determined to be hazardous, the user will be responsible for evaluating concentrations for the constituents of concern against the applicable treatment standards or prohibition levels. The federal treatment standards and prohibition levels that apply to LDR waste are published in 40 CFR 268.48 and 40 CFR 264.49 (LDR treatment standards for soils) and a limited list of treatment standards is provided in Table 4-3. For waste codes or constituents that are not found in Table 4-3, refer to 40 CFR 268.40, 268.48, and 268.49 for applicable LDRs. The 1999 edition of the CFR shall be used for consistency with the ARARs cited in the OU 3-13 ROD. For waste that is hazardous by characteristic, the underlying hazardous constituents (UHCs) specified in 40 CFR 268.48, underlying hazardous constituents that can reasonably be expected to be present at the point of generation of the hazardous waste shall also be evaluated. Wastes that are soils will be treated to the alternative LDR treatment standards for contaminated soil (40 CFR 268.49).

Waste profile documentation for all hazardous waste shipped to the ICDF Complex shall include information similar to that found in 40 CFR 268.7, including waste code and applicable treatment standard, subcategory, and underlying hazardous constituents. If the treatment standard is expressed in terms of a concentration limit, the actual concentration of the restricted constituent shall also be reported. If the waste has no listed waste codes and no longer exhibits the characteristic of a hazardous waste because it has been treated, the waste certification form shall include a statement describing the treatment technology that was used and the reason the waste is no longer hazardous.

Table 4-3. LDR limits for selected hazardous wastes.

Waste Code	Waste Description	Regulated Hazardous Constituent	Regulatory Standard (mg/kg total, unless noted otherwise)	40 CFR 268.49 Alternative LDR treatment standards for contaminated soil[c]
D001	Ignitable characteristic waste for high TOC[a] subcategory	NA	Deactivate and meet UTS[b]	NA
D001	High total organic carbon (TOC) ignitable characteristic waste (>10% TOC)	NA	Prohibited from disposal in ICDF	NA
D002	Corrosive characteristic waste	NA	Deactivate and meet universal treatment standards (UTS)	NA
D003	Reactive wastewater reactive subcategory	NA	Deactivate and meet UTS	NA
D003	Reactive cyanides subcategory	Cyanides (total) Cyanides (amenable)	590 30	5,900 300
D004	Wastes that are toxic for arsenic based on TCLP	Arsenic	5.0 mg/L TCLP and meet UTS	50 mg/L TCLP
D005	Wastes that are toxic for barium based on TCLP	Barium	21 mg/L TCLP and meet UTS	210 mg/L TCLP
D006	Wastes that are toxic for cadmium based on TCLP	Cadmium	0.11 mg/L TCLP and meets UTS	1.1 mg/L TCLP
D007	Wastes that are toxic for chromium based on TCLP	Chromium (total)	0.60 mg/L TCLP and meet UTS	6.0 mg/L TCLP
D008	Wastes that are toxic for lead based on TCLP	Lead	0.75 mg/L TCLP and meet UTS	0.75 mg/L TCLP
D008	Radioactive lead solids (for example, lead shielding and elemental lead)	Lead	Macroencapsulation	NA
D009	Wastes that are toxic for mercury based on TCLP and that contain less than 260 mg/kg total mercury	Mercury	0.20 mg/L TCLP and meet UTS	0.25 mg/L TCLP
D009	Elemental mercury contaminated with radioactive materials	Mercury	Amalgamation	NA

Table 4-3. (continued).

Waste Code	Waste Description	Regulated Hazardous Constituent	Regulatory Standard (mg/kg total, unless noted otherwise)	40 CFR 268.49 Alternative LDR treatment standards for contaminated soil[c]
D010	Wastes that are toxic for selenium based on TCLP	Selenium	5.7 mg/L TCLP and meet UTS	57 mg/L TCLP
D011	Wastes that are toxic for silver based on TCLP	Silver	0.14 mg/L TCLP and meet UTS	1.4 mg/L TCLP
D012	Wastes that are toxic for Endrin based on TCLP	Endrin Endrin aldehyde	0.13 and meet UTS	1.3 mg/kg
D013	Wastes that are toxic for Lindane based on TCLP	Alpha-BHC Beta-BHC Delta-BHC Gamma-BHC (lindane)	0.066 and meet UTS	NA
D014	Wastes that are toxic for methoxychlor based on TCLP	Methoxychlor	0.18 and meet UTS	1.8 mg/kg
D015	Wastes that are toxic for toxaphene based on TCLP	Toxaphene	2.6 and meet UTS	26 mg/kg
D016	Wastes that are toxic for 2,4-D based on TCLP	2,4-D	10 and meet UTS	100 mg/kg
D017	Wastes that are toxic for 2,4,5-TP (silvex) based on TCLP	2,4,5-TP (silvex)	7.9 and meet UTS	79 mg/kg
D018	Wastes that are toxic for benzene based on TCLP	Benzene	10 and meet UTS	100 mg/kg
D019	Wastes that are toxic for carbon tetrachloride based on TCLP	Carbon tetrachloride	6.0 and meet UTS	60 mg/kg
D020	Wastes that are toxic for chlordane based on TCLP	Chlordane	0.26 and meet UTS	2.6 mg/kg
D021	Wastes that are toxic for chlorobenzene based on TCLP	Chlorobenzene	6.0 and meet UTS	60 mg/kg
D022	Wastes that are toxic for chloroform based on TCLP	Chloroform	6.0 and meet UTS	60 mg/kg

Table 4-3. (continued).

Waste Code	Waste Description	Regulated Hazardous Constituent	Regulatory Standard (mg/kg total, unless noted otherwise)	40 CFR 268.49 Alternative LDR treatment standards for contaminated soil[c]
D023	Wastes that are toxic for o-cresol based on TCLP	o-Cresol	5.6 and meet UTS	56 mg/kg
D024	Wastes that are toxic for m-cresol based on TCLP	m-Cresol	5.6 and meet UTS	56 mg/kg
D025	Wastes that are toxic for p-cresol based on TCLP	p-Cresol	5.6 and meet UTS	56 mg/kg
D026	Wastes that are toxic for cresols (total) based on TCLP	Cresols	11.2 and meet UTS	NA
D027	Wastes that are toxic for 1,4-dichlorobenzene based on TCLP	1,4-Dichlorobenzene	6.0 and meet UTS	60 mg/kg
D028	Wastes that are toxic for 1,2-dichloroethane based on TCLP	1,2-Dichloroethane	6.0 and meet UTS	60 mg/kg
D029	Wastes that are toxic for 1,1-dichloroethylene based on TCLP	1,1-Dichloroethylene	6.0 and meet UTS	60 mg/kg
D030	Wastes that are toxic for 2,4-dinitrotoluene based on TCLP	2,4-Dinitrotoluene	140 and meet UTS	1400 mg/kg
D031	Wastes that are toxic for heptachlor based on TCLP	Heptachlor Heptachlor epoxide	0.066 and meet UTS	0.66 mg/kg
D032	Wastes that are toxic for hexachlorobenzene based on TCLP	Hexachlorobenzene	10 and meet UTS	100 mg/kg
D033	Wastes that are toxic for hexachlorobutadiene based on TCLP	Hexachlorobutadiene	5.6 and meet UTS	56 mg/kg
D034	Wastes that are toxic for hexachloroethane based on TCLP	Hexachloroethane	30 and meet UTS	300 mg/kg
D035	Wastes that are toxic for methyl ethyl ketone based on TCLP	Methyl ethyl ketone	36 and meet UTS	330 mg/kg
D036	Wastes that are toxic for nitrobenzene based on TCLP	Nitrobenzene	14 and meet UTS	140 mg/kg

Table 4-3. (continued).

Waste Code	Waste Description	Regulated Hazardous Constituent	Regulatory Standard (mg/kg total, unless noted otherwise)	40 CFR 268.49 Alternative LDR treatment standards for contaminated soil[c]
D037	Wastes that are toxic for pentachlorophenol based on TCLP	Pentachlorophenol	7.4 and meet UTS	74 mg/kg
D038	Wastes that are toxic for pyradine based on TCLP	Pyradine	16 and meet UTS	160 mg/kg
D039	Wastes that are toxic for tetrachloroethylene based on TCLP	Tetrachloroethylene	6.0 and meet UTS	60 mg/kg
D040	Wastes that are toxic for trichloroethylene based on TCLP	Trichloroethylene	6.0 and meet UTS	60 mg/kg
D041	Wastes that are toxic for 2,4,5-trichlorophenol based on TCLP	2,4,5-Trichlorophenol	7.4 and meet UTS	74 mg/kg
D042	Wastes that are toxic for 2,4,6-trichlorophenol based on TCLP	2,4,6-Trichlorophenol	7.4 and meet UTS	74 mg/kg
D043	Wastes that are toxic for vinyl chloride based on TCLP	Vinyl chloride	6.0 and meet UTS	60 mg/kg
F001, F002, F003, F004, F005	Listed spent solvent wastes	Acetone	160	1,600 mg/kg
		Benzene	10	100 mg/kg
		n-Butyl alcohol	2.6	26 mg/kg
		Carbon disulfide	(see 40 CFR 268)	480 mg/L TCLP
		Carbon tetrachloride	6.0	60 mg/kg
		o-Cresol	5.6	56 mg/kg
		m-Cresol	5.6	56 mg/kg
		p-Cresol	5.6	56 mg/kg
		Cresol mixtures	11.2	NA
		Cyclohexanone	(see 40 CFR 268)	7.5 mg/L TCLP
		o-Dichlorobenzene	6.0	60 mg/kg
		Ethyl acetate	33	330 mg/kg
		Ethyl benzene	10	100 mg/kg
		Ethyl ether	160	1,600 mg/kg

Table 4-3. (continued).

Waste Code	Waste Description	Regulated Hazardous Constituent	Regulatory Standard (mg/kg total, unless noted otherwise)	40 CFR 268.49 Alternative LDR treatment standards for contaminated soil[c]
		Isobutyl alcohol	170	1,700 mg/kg
		Methanol	(see 40 CFR 268)	7.5 mg/L TCLP
		Methylene chloride	30	300 mg/kg
		Methyl ethyl ketone	36	360 mg/kg
		Methyl isobutyl ketone	33	330 mg/kg
		Nitrobenzene	14	140 mg/kg
		Pyridine	16	160 mg/kg
		Tetrachloroethylene	6.0	60 mg/kg
		Toluene	10	100 mg/kg
		1,1,1-Trichloroethane	6.0	60 mg/kg
		1,1,2-Trichloroethane	6.0	60 mg/kg
		1,1,2-Trichloro-1,2,2-trifluoroethane	30	300 mg/kg
		Trichloroethylene	6.0	60 mg/kg
		Trichloromonofluoro methane	30	300 mg/kg
		Xylenes	30	300 mg/kg
		Chlorobenzene	6.0	60 mg/kg
U134	Hydrogen fluoride	Fluoride (measured in wastewater only)	NA	NA

a. TOC (total organic compounds).

b. Universal Treatment Standards.

c. When treatment of any constituent subject to treatment to a 90% reduction standard would result in concentrations less than 10 times the Universal Treatment Standard for that constituent, treatment to achieve constituent concentrations less than 10 times is not required (40 CFR 268.49 (c) (1)(c)).

d. Note: Table represents a partial list of waste codes most likely to be encountered during remediation activities at the INEEL. 40 CFR 268 will be consulted to ensure the applicable standard is used.

Wastes from within the AOC may be staged or stored in a manner that triggers placement. If wastes from within the AOC trigger placement, they must comply with LDRs. Wastes that have been treated to meet the LDR for characteristic waste must also meet the UTS for underlying hazardous constituents. Determination of whether a waste is listed or characteristic must be performed by the generator and documented on the waste profile.

The determination of a characteristic waste may be based on comparison to the TCLP regulatory levels. If the total metals concentrations exceed the associated TCLP regulatory levels for characteristic waste by more than 20 times, then TCLP analysis may be necessary to determine if the waste is RCRA characteristic. For wastes containing organic constituents that would cause the waste to be characteristic

by TCLP, the constituent must be present below the applicable LDR and UTS levels for the waste to be accepted into the ICDF landfill. In the case of organic constituents, concentrations below the 20 times rule can be used to show that a TCLP analysis is not required. For concentrations over 20 times, if other information is not available to quantitatively show the waste is not hazardous, a TCLP analysis will be performed.

4.1.4.3 Organic Constituents. Wastes containing PCBs in concentrations greater than 500 ppm cannot be placed in the ICDF landfill because these wastes must be incinerated (40 CFR 761).

Wastes containing organic concentrations of at least 10% by weight cannot be placed in the ICDF landfill (40 CFR 264, Subpart BB). This applies to the leachate collection and removal system including pumps, compressors, and pressure relief valves.

Wastes containing volatile organic concentrations >500 parts per million will not be accepted (40 CFR 264.1082[c][i]). By meeting this requirement, the ICDF will be exempt from the standards in 40 CFR 264.1084 through 264.1087.

Wastes containing greater than 1% chelating compounds cannot be placed in the ICDF landfill (DOE Order 435.1).

4.1.4.4 Inorganics/Other. There are no ARAR-based limitations on inorganic content in the wastes from inside the AOC (LDRs do not apply).

4.1.4.5 Radionuclides. Regulatory limits on radionuclide activity that can be disposed to the ICDF landfill are invoked by the ROD (DOE-ID 1999) and DOE Order 435.1 as discussed below.

The Appendix A to the OU 3-13 ROD *Response to Public Comment* states in response to comments #28, 226, and 230 that waste containing greater than 10 nanocuries per gram (nCi/g) of transuranic (TRU) radionuclides is prohibited from disposal at the ICDF landfill (DOE-ID 1999).

DOE Order 435.1 defines TRU waste as follows: *TRU waste is radioactive waste containing more than 100 nanocuries (3,700 becquerels) of alpha-emitting TRU isotopes per gram of waste, with half-lives greater than 20 years, except for:*

1. High-level radioactive waste

2. Waste that the Secretary of Energy has determined, with the concurrence of the Administrator of the EPA, does not need the degree of isolation required by the 40 CFR Part 191 disposal regulations

3. Waste that the NRC has approved for disposal on a case-by-case basis in accordance with 10 CFR Part 61.

Because the ROD restriction is based on TRU isotopes, the 10 nCi/g for the WAC was calculated as follows. The alpha-emitting TRU isotopes, with half-lives greater than 20 years, are Np-237, Pu-238, Pu-239, Pu-240, Pu-242, Pu-244, Am-241, Am-243, Cm 243, Cm-245, Cm-246, Cm-248, Cm-250, Bk-247, Cf-249, and Cf-251. These isotopes may be present in unequal amounts; the sum of all TRU isotopes must total less than 10 nCi/g for the entire waste stream.

The NRC performance-based disposal requirement (10 CFR Part 61) is invoked by DOE Order 435.1 and includes radiological waste classification. Waste greater than Class C wastes cannot be

disposed to the ICDF landfill. The exact regulatory text for determining waste classification is provided in Appendix C.

4.1.5 NESHAPs Compliance

Compliance with NESHAPs limits will be conducted in conjunction with INEEL on a site-wide basis. The ICDF Complex will not contribute more than 10 mrem/yr (the federal allowable limit) to the maximally exposed individual at the site boundary. To ensure that the ICDF Complex is not a major factor in changing INEEL NESHAPs status, an operational goal for the complex will be set at 1 mrem/yr. This will be met through operational constraints to be outlined in the ICDF Complex WAC (DOE-ID 2002a), developed prior to start up of the facility. The emissions from the ICDF Complex will be calculated on an annual basis and included with the INEEL Annual NESHAPs report. If the operational goal of 1 mrem/yr is exceeded, the agencies will be notified.

4.2 Development of Numerical Waste Acceptance Criteria

For wastes within the AOC, the WAC for each hazardous constituent and radionuclide was calculated based on the RAOs identified in the OU 3-13 ROD, the logic for determining the allowable WAC concentration for each constituent from inside the AOC is shown in Figure 4-1. Comparison of all the criteria is done in Appendix D. Specific numerical WACs are found in Section 5.

Contaminant fate and transport modeling provides the basis for developing groundwater RAO-based waste soil contaminant concentrations. The groundwater RAOs for this activity are the MCL promulgated under the Safe Drinking Water Act, risk-based concentrations derived from a cumulative 1×10^{-4} excess lifetime cancer risk (ELCR), and risk-based concentrations derived from a HI of 1 for non-carcinogens. The use of groundwater RAO-based concentrations provides the basis for ensuring that waste soil disposed in the landfill will not cause exceedences of the RAOs at the downgradient groundwater assessment point. The RAO-based waste soil concentration limits were developed where appropriate on a cumulative basis. Because the inventory of actual waste received into the facility can be controlled administratively, the individual constituent RAO-based limits can be combined and adjusted to produce a disposed waste stream that exhibits an acceptable overall cumulative value for the RAO limits. The inventory of radionuclides and other constituents will be tracked by the waste tracking system described in Section 3.3 of the *ICDF Complex Waste Acceptance Criteria* (DOE-ID 2002a). The tracking system will be able to continually update estimates of radiological and other contaminants of concern inventory.

The allowable concentrations of constituents in the waste soil that will be placed in the ICDF are calculated to be protective of groundwater. These concentrations are the lowest of the carcinogenic and non-carcinogenic risk-based concentrations, and MCLs. The MCL calculations are performed separate from the risk-based calculations. The total risk allowable at the ICDF is 10^{-4} carcinogenic risk and a HI of 1. Development of the calculated RAO-based waste soil concentrations is discussed in Appendix A, and RAO-based criteria are given in the spreadsheet in Appendix A.

For a few constituents, the background concentration is greater than the design inventory concentration. As such, these constituents will not be included in the cumulative ELCR or HI evaluation. These constituents are based on the presence of "risk factors" (Appendix A). For those constituents that do have a risk factor, the numerical WAC associated with the risk-based criteria is set at 10 times the background concentration. Defaulting to the background concentrations enables the ICDF to monitor those constituents should actual waste shipments differ from the design inventory.

For some constituents that do not present a risk, that are not specifically addressed by ARARs, and that do not present a liner compatibility issue in leachate, there are no numerical criteria limits.

4.3 Tracking Waste Acceptance Criteria During Operations

The WAC presented herein have been developed based on data regarding the proposed design inventory, achieving RAOs, liner compatibility, and regulatory requirements. On a RAO basis, the WAC has been developed by assuming all contaminants are present in the entire volume of the landfill (510,000 yd^3). The liner compatibility criteria are based on individual constituent limits and/or on a total maximum concentration by chemical category (i.e., 500,000 ppm for total organics). Actual wastes entering the landfill will have different contaminant concentrations from the assumptions made in the WAC and periodic evaluation will be necessary to track the actual contaminants entering the landfill for comparison against RAO, liner compatibility, or other regulatory limits.

The following methodology is provided as one method of tracking receipt of actual waste contaminants and contaminant masses versus the proposed WAC:

1. Each waste load or container will have a waste container profile identifying the substances and concentrations contained in the waste. This waste container profile may be the same as the waste profile, but will not exceed the concentrations in the waste profile.

2. The mass of each constituent placed in the landfill will be calculated for each waste load or container using the information from the waste container profile (weight × concentration for each constituent).

3. A database or spreadsheet will be kept identifying each constituent and the cumulative mass of each constituent placed in the landfill.

4. A running inventory will be maintained of the total mass of each constituent received at the facility. The total mass received for each substance will be compared to the total mass limit of the substance identified in the WAC. This comparison for each substance will provide an indication of how much of the WAC limit has been used by the actual substances in the waste. In addition, average concentrations of the constituents in each container or waste load will be checked against concentration-based criteria.

As the waste is placed in the landfill, the tracking system will record the cumulative total of each substance mass. If waste concentrations are significantly lower than the WAC limits, the concentration guidelines can be increased without impacting the total mass limits in the WAC. Any changes in the WAC concentrations will be recorded in a revision to this document and follow the requirements for revisions to a Federal Facility Agreement and Consent Order primary document. The waste tracking system will be described in the remedial action work plan.

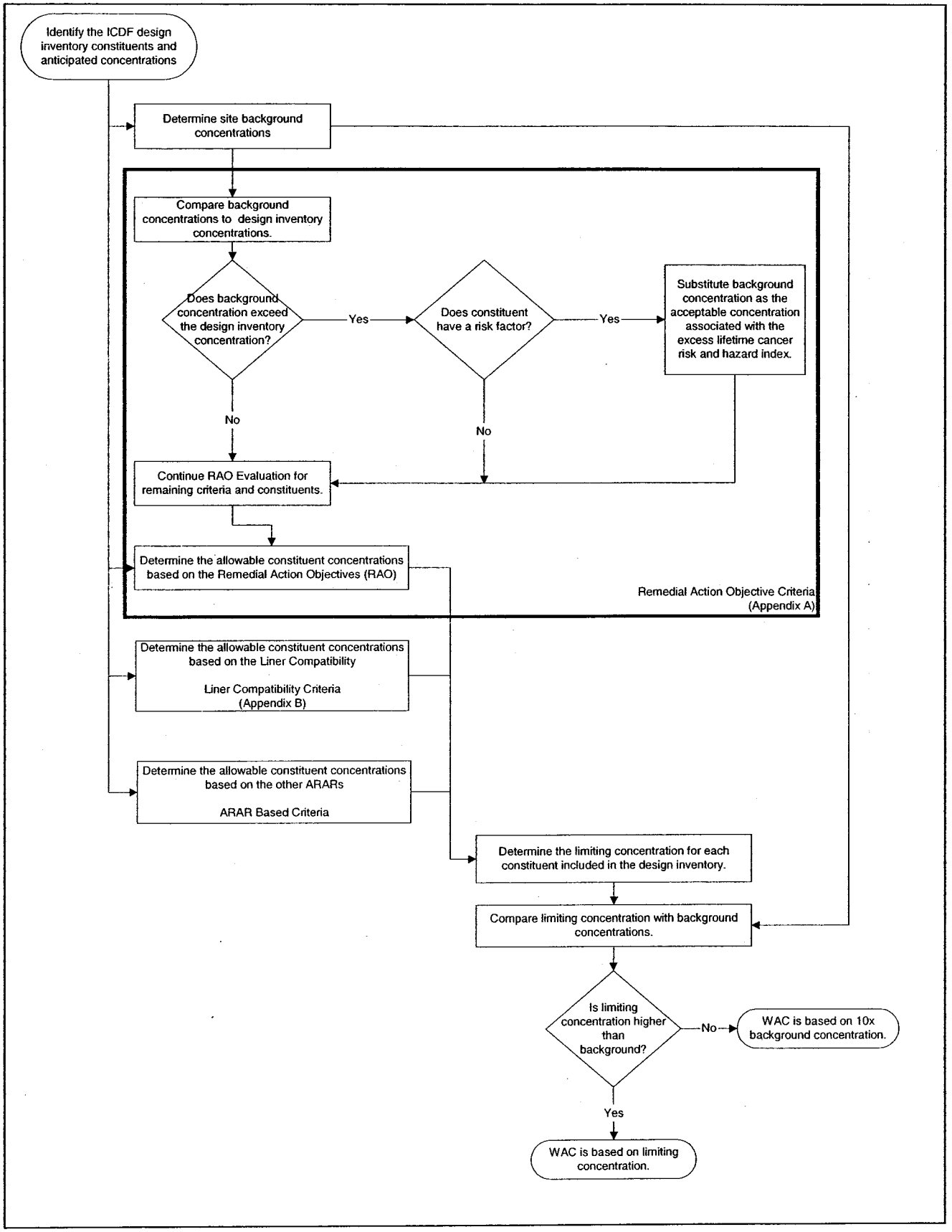

Figure 4-1. WAC development logic.

5. ACCEPTANCE CRITERIA FOR THE ICDF LANDFILL

5.1 Prohibited Waste

The wastes that are prohibited from disposal in the ICDF landfill are described in this section. The QA program will include a determination that no prohibited wastes are accepted for disposal to the ICDF landfill.

5.1.1 Waste With >10 nCi/g TRU Constituents

Waste containing greater than 10 nCi/g of TRU radionuclides is prohibited from disposal at the ICDF landfill in accordance with the OU 3-13 ROD (Appendix A, OU 3-13 Responsiveness Summary, Responses to comments #28, 226, and 230 [DOE-ID 1999]).

5.1.2 TSCA Waste Containing > 500 ppm PCBs

TSCA waste containing greater than 500 ppm of PCBs is prohibited from disposal at the ICDF landfill, in accordance with 40 CFR 761.60. No waste greater than 500 ppm of PCBs is expected, based on the inventory described in "INEEL CERCLA Disposal Facility Design Inventory" (EDF-ER-264).

5.1.3 Free Liquids

Waste containing free liquids is prohibited from disposal at the ICDF landfill, unless the liquids have been stabilized. If necessary, the presence of free liquids shall be determined by EPA Method 9095 ("Paint Filter Liquids Test") (EPA 1986) before shipment to the ICDF Complex.

5.1.4 Waste Capable of Detonation, Explosive Decomposition or Reaction

Waste capable of detonation or explosive decomposition is prohibited. This includes ordnance and explosive materials that may be encountered during excavation of waste. Generally, process knowledge will be used to make the determination that a waste is or is not capable of detonation or explosive decomposition, based on unexploded observable ordnance. If it is not clear based on process knowledge, specific testing of the waste may be required.

5.1.5 Waste Capable of Generating Toxic Gases, Vapors, or Fumes

Waste capable of generating toxic gases, vapors, or fumes harmful to persons transporting, handling, and disposing the waste (DOE Manual 435.1) is prohibited. The only allowable degradable wastes are wood, building demolition debris, PPE, and metals. Toxic gasses are not formed from the degradation of these materials.

5.1.6 Gaseous Waste

All gaseous waste containers must be empty and flattened.

5.1.7 Waste Exceeding the Class C Limit

Waste exceeding the Class C radioactive waste limit, as defined in 10 CFR 61.55, is prohibited.

5.1.8 Waste Containing Greater than 1% Chelating Compounds by Weight

Waste containing greater than 1% chelating compounds by weight is prohibited. Chelating compounds may mobilize constituents and cause exceedence of the RAOs. Examples of chelating compounds are glycinate, salicylate, chelidamic acid, and phthalic acid,

5.1.9 Spent Nuclear Fuel and High-Level Waste

Spent nuclear fuel and high-level waste (DOE Manual 435.1) are prohibited.

5.1.10 Volatile Organic Wastes >500 ppm

Organic wastes >500 ppm are prohibited (40 CFR 1082 [c][I]).

5.2 Restricted Wastes Requiring Treatment

Table 5-1 lists the materials restricted from disposal to the ICDF landfill until specific conditions are met.

Table 5-1. Materials restricted from disposal at the ICDF landfill until the listed conditions have been met.

Restricted Material	Condition to be Met
Hazardous waste outside AOC	Hazardous waste from outside the AOC must be treated to meet UTSs.
Bulk disposal of waste containing free liquids	Free liquids must be eliminated by stabilization (adding materials to chemically immobilize the free liquids in the waste).
	If necessary, the presence of free liquids shall be determined by EPA Method 9095 ("Paint Filter Liquids Test") (EPA 1986) before shipment to the ICDF Complex.
Containerized waste holding free liquids, unless one of the following conditions has been met:	All freestanding liquid has been decanted, solidified with nonbiodegradable sorbent materials, stabilized, or otherwise eliminated[a].
	The waste has been converted into a form that contains as little freestanding and noncorrosive liquid as is reasonably achievable. In no case shall the liquid exceed 1% of the waste volume in a disposal container or 0.5% of the waste volume processed to a stable form[a].
LDR—Restricted waste	Must meet LDR requirements for 40 CFR 268.
Refrigerant-bearing equipment containing chlorofluorocarbons (CFCs)	CFC removal has been completed (40 CFR 82).
Pyrophoric waste	The waste must be treated, prepared, and packaged to be nonflammable prior to being disposed.
Infectious waste, as defined in 10 CFR 61 (including "any substance that may harbor or transmit pathogenic organisms," which may apply to septic tank sludge)	Special handling procedures will be developed.
pH <2 or >12.5	Neutralized.

Table 5-1. (continued).

Restricted Material	Condition to be Met
Wastes containing >500 ppm volatile organics	Must be treated to reduce volatile organics to <500 ppm (40 CFR 26.1082 [c}[1]).
Trinitrotoluene (TNT) Royal Dutch explosives (RDX)	The waste must not be capable of detonation, explosive decomposition, or reaction at normal pressures and temperature, or explosive reaction with water.

a. A procedure for determination of free liquids is provided in the ICDF Complex O&M Manual.

5.3 Physical and Chemical Criteria

Logic for development of the maximum allowable risk-based chemical and radiological concentrations in the WAC is shown in Figure 4-1. The chemical limits for waste from within the WAG 3 AOC that have not triggered placement, and radiological WAC limits are shown in Table 5-2. A comparison of these WAC limits to the design inventory concentrations is provided in Appendix F. This comparison indicates that the maximum ratio of the design inventory concentrations to the WAC concentrations is approximately 42%, with the majority of the constituents at approximately 0.1%. This indicates that all of the design inventory constituents are a minimum of 58% less than the WAC limit. This also assumes that the entire volume of the landfill is filled with waste having the maximum concentration. In different terminology, the safety margin between the design inventory concentration and the WAC concentration is a minimum of 2.38 and typically 1,000.

The objective of this safety margin is to provide flexibility in the waste acceptance process in case actual waste concentrations are higher than the design inventory. Waste concentrations coming into the ICDF are anticipated to be indicative of the design inventory concentrations rather than the WAC concentrations. However, if waste characterization identifies waste concentrations that approach a WAC limit, the waste acceptance process will ensure protection of human health and the environment based on analysis of actual waste concentrations. These safety margins should adequately cover the uncertainty of concentrations that may be disposed at the landfill.

5.3.1 Liquid and Liquid-Containing Waste

For liquid-containing waste where condensate could form in inner plastic packaging (for example, bags) subsequent to packaging, the condensate shall be eliminated to the maximum extent practical by placing sorbents within the inner plastic packaging. In any case, the amount of liquid may not exceed 1% of the volume of the waste or 0.5% of waste processed to a stable form.

Residual liquids in large debris items shall be sorbed or removed. In cases where removing suspected liquids is not practical and sampling to determine if liquids are present is impossible, the liquids shall be removed to the maximum extent possible by draining suspected liquids at low points and placing an adequate amount of sorbent around each item. In any case, the amount of liquid cannot exceed 1% of the volume of the waste.

5.3.2 Land Disposal Restrictions

The application of LDRs for waste that is either a listed waste and/or characteristic waste depends on whether a waste originates from inside the WAG 3 AOC or has triggered placement. The discussion of what triggers LDRs is found in Section 4.

Wastes originating inside the WAG 3 AOC (that have not triggered placement) are acceptable for direct disposal in the ICDF landfill without the need to meet the RCRA LDRs specified in the OU 3-13 ROD (DOE-ID 1999), provided that the waste meets the appropriate WAC.

The numerical WAC for organic and inorganic constituents for wastes not subject to LDRs was based on the logic described in Section 4. Each of the numerical criteria is shown in Appendix D, with the lowest number selected as the landfill WAC.

Table 5-2. ICDF landfill Waste Acceptance Criteria.

Constituent[a]	Selected WAC Concentration Guideline (mg/kg or pCi/kg)	Landfill WAC Maximum Mass (kg or Ci)	Source of WAC Concentration Guideline
Organics			
1,1,1-Trichloroethane	1.6E + 01	1.2E + 04	RAO
1,1,2,2-Tetrachloroethane	5.0E - 02	3.8E + 01	RAO
1,1,2-Trichloroethane	2.4E - 01	1.8E + 02	RAO
1,1-Dichloroethane	2.3E + 00	1.8E + 03	RAO
1,1-Dichloroethene	1.5E + 00	1.1E + 03	RAO
1,2,4-Trichlorobenzene	1.1E + 01	8.7E + 03	RAO
1,2-Dichlorobenzene	1.1E + 01	8.7E + 03	RAO
1,2-Dichloroethane	5.4E - 03	4.1E + 00	RAO
1,2-Dichloroethene (total)	3.2E - 01	2.5E + 02	RAO
1,3-Dichlorobenzene	1.1E + 01	8.7E + 03	RAO
1,4-Dichlorobenzene	4.4E + 01	3.2E + 04	Regulatory Limit
1,4-Dioxane	1.9E - 02	1.4E + 01	RAO
2,4,5-Trichlorophenol	4.5E + 01	3.4E + 04	RAO
2,4,6-Trichlorophenol	1.8E + 01	1.4E + 04	RAO
2,4-Dichlorophenol	2.2E + 01	1.6E + 04	RAO
2,4-Dimethylphenol	1.8E + 01	1.4E + 04	RAO
2,4-Dinitrophenol	5.1E + 01	3.9E + 04	RAO
2,4-Dinitrotoluene	1.1E + 01	8.7E + 03	RAO
2,6-Dinitrotoluene	2.1E + 01	1.6E + 04	RAO
2-Butanone	2.5E + 01	1.9E + 04	RAO
2-Chloronaphthalene	1.1E + 01	8.7E + 03	RAO
2-Chlorophenol	1.8E + 01	1.4E + 04	RAO
2-Hexanone	2.7E + 00	2.0E + 03	RAO
2-Methylnaphthalene	5.1E + 02	3.9E + 05	RAO
2-Methylphenol	2.1E + 01	1.6E + 04	RAO
2-Nitroaniline	1.0E - 01	7.7E + 01	RAO
2-Nitrophenol	1.8E + 01	1.4E + 04	RAO
3,3'-Dichlorobenzidine	1.1E + 01	8.7E + 03	RAO

Table 5-2. (continued).

Constituent[a]	Selected WAC Concentration Guideline (mg/kg or pCi/kg)	Landfill WAC Maximum Mass (kg or Ci)	Source of WAC Concentration Guideline
3-Methyl Butanal	3.3E + 04	2.5E + 07	Liner Compatibility
3-Nitroaniline	1.0E - 01	7.7E + 01	RAO
4,6-Dinitro-2-methylphenol	4.5E + 01	3.4E + 04	RAO
4-Bromophenyl-phenylether	8.5E + 04	6.5E + 07	Liner Compatibility
4-Chloro-3-methylphenol	9.6E + 04	7.3E + 07	Liner Compatibility
4-Chloroaniline	4.1E + 01	3.1E + 04	RAO
4-Chlorophenyl-phenylether	1.0E + 05	7.6E + 07	Regulatory Limit
4-Methyl-2-Pentanone	3.0E + 01	2.2E + 04	RAO
4-Methylphenol	3.9E + 01	2.9E + 04	RAO
4-Nitroaniline	1.0E - 01	7.7E + 01	RAO
4-Nitrophenol	5.2E + 01	3.9E + 04	RAO
Acenaphthene	2.0E + 02	1.5E + 05	RAO
Acenaphthylene	2.1E + 01	1.6E + 04	RAO
Acetone	4.9E + 01	3.7E + 04	Regulatory Limit
Acetonitrile	1.2E + 00	8.8E + 02	RAO
Acrolein	5.5E - 01	4.2E + 02	RAO
Acrylonitrile	5.8E - 01	4.4E + 02	RAO
Anthracene	3.2E + 02	2.4E + 05	RAO
Aramite	6.7E + 00	5.1E + 03	RAO
Aroclor-1016	7.7E + 00	5.8E + 03	RAO
Aroclor-1254	1.3E + 02	9.7E + 04	RAO
Aroclor-1260	5.0E + 02	3.8E + 05	Regulatory Limit
Aroclor-1268	6.2E + 01	4.7E + 04	RAO
Benzene	2.2E + 02	1.7E + 05	Regulatory Limit
Benzidine	1.7E + 01	1.3E + 04	RAO
Benzo(a)anthracene	2.5E + 02	1.9E + 05	RAO
Benzo(a)pyrene	1.1E + 02	8.0E + 04	RAO
Benzo(b)fluoranthene	1.8E + 02	1.4E + 05	RAO
Benzo(g,h,i)perylene	1.1E + 01	8.7E + 03	RAO
Benzo(k)fluoranthene	1.9E + 01	1.4E + 04	RAO
Benzoic acid	8.6E + 00	6.5E + 03	RAO
bis(2-Chloroethoxy)methane	1.6E + 02	1.2E + 05	Liner Compatibility
bis(2-Chloroethyl)ether	1.1E + 01	8.7E + 03	RAO
bis(2-Chloroisopropyl)ether	1.1E + 01	8.7E + 03	RAO
bis(2-Ethylhexyl)phthalate	1.5E + 02	1.1E + 05	RAO
Butane,1,1,3,4-Tetrachloro-	1.0E + 05	7.6E + 07	Regulatory Limit

Table 5-2. (continued).

Constituent[a]	Selected WAC Concentration Guideline (mg/kg or pCi/kg)	Landfill WAC Maximum Mass (kg or Ci)	Source of WAC Concentration Guideline
Butylbenzylphthalate	6.8E + 01	5.2E + 04	RAO
Carbazole	3.2E + 01	2.5E + 04	RAO
Carbon Disulfide	4.6E + 01	3.5E + 04	RAO
Chlorobenzene	6.6E + 00	5.0E + 03	RAO
Chloroethane	1.5E - 01	1.1E + 02	RAO
Chloromethane	3.5E - 01	2.7E + 02	RAO
Chrysene	2.7E + 02	2.0E + 05	RAO
Decane, 3,4-Dimethyl	3.3E + 04	2.5E + 07	Liner Compatibility
Diacetone alcohol	1.0E + 05	7.6E + 07	Regulatory Limit
Dibenz(a,h)anthracene	1.1E + 01	8.7E + 03	RAO
Dibenzofuran	3.2E + 02	2.5E + 05	RAO
Diethylphthalate	1.1E + 01	8.7E + 03	RAO
Dimethyl Disulfide	3.3E + 04	2.5E + 07	Liner Compatibility
Dimethylphthalate	1.1E + 01	8.7E + 03	RAO
Di-n-butylphthalate	2.4E + 01	1.8E + 04	RAO
Di-n-octylphthalate	2.6E + 01	2.0E + 04	RAO
Eicosane	1.0E + 05	7.6E + 07	Regulatory Limit
Ethyl cyanide	3.3E + 04	2.5E + 07	Liner Compatibility
Ethylbenzene	7.8E + 01	5.9E + 04	RAO
Famphur	1.0E + 05	7.6E + 07	Regulatory Limit
Fluoranthene	7.6E + 02	5.8E + 05	RAO
Fluorene	1.8E + 02	1.4E + 05	RAO
Heptadecane, 2,6,10,15-Tetra	3.3E + 04	2.5E + 07	Liner Compatibility
Hexachlorobenzene	1.1E + 01	8.7E + 03	RAO
Hexachlorobutadiene	2.1E + 01	1.6E + 04	RAO
Hexachlorocyclopentadiene	1.1E + 01	8.7E + 03	RAO
Hexachloroethane	1.1E + 01	8.7E + 03	RAO
Indeno(1,2,3-cd)pyrene	1.1E + 01	8.7E + 03	RAO
Isobutyl alcohol	1.2E + 00	8.8E + 02	RAO
Isophorone	1.1E + 01	8.7E + 03	RAO
Isopropyl Alcohol/2-propanol	1.0E + 05	7.6E + 07	Regulatory Limit
Kepone	9.9E + 01	7.5E + 04	RAO
Mesityl oxide	1.0E + 05	7.6E + 07	Regulatory Limit
Methyl Acetate	4.8E - 01	3.7E + 02	RAO
Methylene Chloride	2.7E + 01	2.1E + 04	Liner Compatibility
Naphthalene	4.3E + 02	3.2E + 05	RAO

Table 5-2. (continued).

Constituent[a]	Selected WAC Concentration Guideline (mg/kg or pCi/kg)	Landfill WAC Maximum Mass (kg or Ci)	Source of WAC Concentration Guideline
Nitrobenzene	1.1E + 01	8.7E + 03	RAO
N-Nitroso-di-n-propylamine	1.1E + 01	8.7E + 03	RAO
N-Nitrosodiphenylamine	1.1E + 01	8.7E + 03	RAO
Octane,2,3,7-Trimethyl	3.3E + 04	2.5E + 07	Liner Compatibility
o-Toluenesulfonamide	3.3E + 04	2.5E + 07	Liner Compatibility
Pentachlorophenol	5.6E + 01	4.2E + 04	RAO
Phenanthrene	1.2E + 03	8.9E + 05	RAO
Phenol	8.0E + 01	6.1E + 04	RAO
Phenol,2,6-Bis(1,1-Dimethyl)	1.0E + 05	7.6E + 07	Regulatory Limit
p-Toluenesulfonamide	3.3E + 04	2.5E + 07	Liner Compatibility
Pyrene	2.5E + 02	1.9E + 05	RAO
RDX	1.0E + 01	7.9E + 03	RAO
Styrene	6.1E - 02	4.6E + 01	RAO
Tetrachloroethene	9.6E + 00	7.3E + 03	RAO
Toluene	3.0E + 01	2.2E + 04	Regulatory Limit
Tributylphosphate	4.8E + 02	3.6E + 05	Liner Compatibility
Trichloroethene	3.1E + 01	2.3E + 04	Regulatory Limit
Trinitrotoluene	1.1E + 01	8.4E + 03	RAO
Undecane,4,6-Dimethyl-	3.3E + 02	2.5E + 05	Liner Compatibility
Xylene (ortho)	3.9E + 00	2.9E + 03	RAO
Xylene (total)	2.8E + 02	2.1E + 05	Regulatory Limit
Inorganics			
Aluminum	1.6E + 05	1.2E + 08	10 X Background
Antimony	5.8E + 03	4.4E + 06	RAO
Arsenic	5.8E + 01	4.4E + 04	RAO
Barium	3.0E + 03	2.3E + 06	RAO
Beryllium	1.8E + 01	1.4E + 04	RAO
Boron	3.3E + 03	2.5E + 06	RAO
Cadmium	3.6E + 03	2.7E + 06	RAO
Calcium	No Limit	No Limit	Liner Compatibility
Chloride	3.3E + 04	2.5E + 07	Liner Compatibility
Chromium	4.1E + 04	3.1E + 07	RAO
Cobalt	1.1E + 02	8.3E + 04	RAO
Copper	3.0E + 04	2.3E + 07	RAO
Cyanide	3.4E + 02	2.6E + 05	RAO
Dysprosium	5.9E + 04	4.5E + 07	RAO

Table 5-2. (continued).

Constituent[a]	Selected WAC Concentration Guideline (mg/kg or pCi/kg)	Landfill WAC Maximum Mass (kg or Ci)	Source of WAC Concentration Guideline
Fluoride	3.9E + 03	2.9E + 06	RAO
Iron	2.4E + 05	1.8E + 08	10 × Background
Lead	5.8E + 04	4.4E + 07	RAO
Magnesium	1.2E + 05	9.1E + 07	10 × Background
Manganese	4.9E + 03	3.7E + 06	RAO
Mercury	9.5E + 03	7.2E + 06	RAO
Molybdenum	1.0E + 04	7.7E + 06	RAO
Nickel	3.5E + 02	2.7E + 05	RAO
Nitrate	3.9E + 03	3.0E + 06	RAO
Nitrate/Nitrite-N	3.3E + 04	2.5E + 07	Liner Compatibility
Nitrite	8.5E + 00	6.4E + 03	RAO
Phosphorus	No Limit	No Limit	Liner Compatibility
Potassium	4.3E + 04	3.3E + 07	10 × Background
Selenium	8.5E + 02	6.4E + 05	RAO
Silver	9.8E + 03	7.5E + 06	RAO
Sodium	3.2E + 03	2.4E + 06	10 × Background
Strontium	1.8E + 04	1.4E + 07	RAO
Sulfate	3.3E + 04	2.5E + 07	Liner Compatibility
Sulfide	3.3E + 04	2.5E + 07	Liner Compatibility
Terbium	No Limit	No Limit	Liner Compatibility
Thallium	4.3E + 00	3.3E + 03	RAO
Vanadium	4.5E + 02	3.4E + 05	RAO
Ytterbium	No Limit	No Limit	Liner Compatibility
Zinc	2.1E + 05	1.6E + 08	RAO
Zirconium	No Limit	No Limit	Liner Compatibility
Radionuclides			
Ag-108m	8.0E + 05	6.1E + 02	RAO
Am-241	1.0E + 07	7.6E + 03	Regulatory Limit
Am-243	3.3E + 02	2.5E – 01	RAO
Ba-137m	No Limit	No Limit	Liner Compatibility
C-14	3.0E + 03	2.3E – 00	RAO
Cd-113m	1.6E + 06	1.2E + 03	RAO
Ce-144	1.8E + 03	1.4E + 00	RAO
Co-57	3.7E + 03	2.8E + 00	RAO
Co-60	1.9E + 08	1.5E + 05	RAO
Cs-134	1.1E + 07	8.5E + 03	RAO

Table 5-2. (continued).

Constituent[a]	Selected WAC Concentration Guideline (mg/kg or pCi/kg)	Landfill WAC Maximum Mass (kg or Ci)	Source of WAC Concentration Guideline
Cs-137	2.3E + 12	1.7E + 09	Regulatory Limit
Eu-152	9.7E + 08	7.3E + 05	RAO
Eu-154	8.2E + 08	6.2E + 05	RAO
Eu-155	1.8E + 08	1.3E + 05	RAO
H-3	5.0E + 07	3.8E + 04	RAO
I-129	3.1E + 03	2.4E + 00	RAO
K-40	2.4E + 05	1.8E + 02	RAO
Kr-85	No Limit	-	RAO
Np-237	6.4E + 05	4.9E + 02	RAO
Pm-147	3.8E + 08	2.9E + 05	RAO
Pu-238	1.0E + 07	7.6E + 03	Regulatory Limit
Pu-239	6.7E + 06	5.1E + 03	RAO
Pu-240	1.5E + 06	1.1E + 03	RAO
Pu-241	6.4E + 07	4.9E + 04	RAO
Ra-226	4.7E + 05	3.6E + 02	RAO
Ru-106	1.2E + 04	9.2E + 00	RAO
Sb-125	9.3E + 06	7.0E + 03	RAO
Sm-151	3.4E + 08	2.6E + 05	RAO
Sr-90	3.5E + 12	2.7E + 09	Regulatory Limit
Tc-99	5.8E + 06	4.4E + 03	RAO
Te-125m	2.3E + 06	1.7E + 03	RAO
Th-228	1.6E + 04	1.2E + 01	RAO
Th-230	1.4E + 04	1.1E + 01	RAO
Th-232	1.7E + 04	1.3E + 01	RAO
U-233	2.6E + 01	1.9E - 02	RAO
U-234	6.0E + 06	2.6E + 03	RAO
U-235	1.1E + 05	8.3E + 01	RAO
U-236	2.0E + 05	1.5E + 02	RAO
U-238	2.0E + 06	1.5E + 03	RAO
Y-90	2.3E + 10	1.7E + 07	RAO

a. The mass values are maximum masses that cannot be exceeded.

5.3.3 Solidification or Stabilization of Organic Liquids and Chelating Compounds

Organic liquids and chelating compounds exceeding 1% of the waste by weight must be solidified or stabilized to a form that immobilizes the organic and chelating compounds.

5.3.4 Asbestos-Containing Waste

Asbestos-containing waste should be sent to the CFA bulk landfill unless the radionuclide content of the waste prevents this disposal. If the waste is radioactive, asbestos-containing waste material shall be packaged in accordance with 40 CFR 61.150. Wetting with water is allowed as long as it does not exceed applicable free liquid requirements. Disposal of asbestos waste will be in accordance with applicable state and federal regulations.

5.3.5 Heat Generation

If heat generation from radiological decay in the waste package exceeds 3.5 watts per m^3 (0.1 watt per ft^3), the package must be evaluated using the conversion factors in Appendix E to ensure that the heat does not affect the integrity of the container or surrounding containers in the ICDF landfill. This evaluation must be provided to and approved by the ICDF Complex Operations Manager.

5.3.6 Gas Generation

Gas generation from radiolytic or biological decomposition of containerized waste must be controlled to prevent pressurization exceeding 1.5 atmospheres (152 kilopascals absolute pressure), and combustible gas (for example, hydrogen, methane) concentrations exceeding the lower explosive limit during handling before disposal. Field methods for determining presence and amount of combustible gas can be used to demonstrate compliance with these criteria.

5.3.7 Physical Limits

Physical requirements may influence the disposal of certain waste types to the ICDF landfill, even when the waste satisfies other ICDF landfill WAC. Physical waste characteristics such as weight, volume, dimensions, or length may require adjustment before the waste is accepted for disposal.

Table 5-4 identifies the physical limits and restrictions that must be met before the waste types will be considered for disposal at the ICDF landfill.

Table 5-4. Physical limits for waste proposed for disposal at the ICDF landfill.

Waste Type	Limits and Restrictions
Steel Boxes	Steel boxes are assumed to be completely filled and, therefore, incompressible. Steel boxes with greater than 5% void space will not be accepted.
Concrete Debris	Concrete may be sent to the ICDF in one of two different forms: Reduced to rubble with a maximum dimension of approximately 1 ft. It is preferred that this rubble be mixed with other waste soil so that it can be handled as soil at the ICDF. Large blocks or slabs may be shipped under the following criteria: It must not exceed the gross weight limit for the container It must not extend above the side walls of the container It shall not exceed 20 ft in length, and must be loaded toward the rear of the box All rebar must be cut flush with the surface.
Steel Plate	Steel plate shall not exceed 4 ft in width or 8 ft in length. To minimize voids, steel plate shall not be bent or folded.

Table 5-4. (continued).

Waste Type	Limits and Restrictions
Rebar	Rebar should be cut to lengths of approximately 4 ft and mixed with soil to the extent practical. Rebar pieces where soil is not common can be placed in bulk roll-off containers with other hard debris.

5.4 Radiological Criteria

5.4.1 Radiological Concentration Limits

Restrictions on the activity of radionuclides that can be placed in the ICDF landfill were determined in an iterative process that is discussed in Section 4.2. In anticipation that wastes not currently in the inventory will be discovered, the WAC is based on a combination of the total allowable inventory of radionuclides that may impact groundwater, and the protection to worker health and safety. WAC for radionuclides that were not evaluated in development of this WAC will be developed using the same process as was described in Section 4.2 of this document. The radiological concentration (activity limits) given in Table 5-2 were derived from the WAC criteria and logic discussed in Section 4 of this document.

5.4.2 Radiological Inventory Limits

The radiological inventory limits for the ICDF landfill will be maintained to stay within the facility safety envelope and authorization basis. These inventory limits are to be less than a Hazard Category 3 Nuclear Facility.

5.4.3 Criticality Safety Limits

Criticality Safety Limits are described in Section 5.4.3 of the ICDF Complex WAC (DOE-ID 2002a), Table 1-1.

5.4.4 Package External Concentration Limits

Package External Concentration Limits are described in Section 5.4.4 of the ICDF Complex WAC (DOE-ID 2002a), Table 1-1.

5.4.5 Package Dose Rate Limits

Package Dose Rate Limits are described in Section 5.4.5 of the ICDF Complex WAC (DOE-ID 2002a), Table 1-1.

5.4.6 Non-Contact-Handled Waste

Non-contact-handled waste shall meet the applicable dose rate restrictions of Department of Transportation or an approved packaging safety analysis. Remote-handled waste shall be configured for unloading such that personnel exposures are maintained ALARA.

5.5 Packaging Criteria

Packaging Criteria are described in Section 5.5 of the ICDF Complex WAC (DOE-ID 2002a), see Table 1-1, except as specifically called out in the following sections.

5.5.1 Outer Packages

Criteria for outer packages is described in Section 5.5.1 of the ICDF Complex WAC (DOE-ID 2002a), Table 1-1.

5.5.2 Condition of Containers

Condition of containers is described in Section 5.5.2 of the ICDF Complex WAC (DOE-ID 2002a), Table 1-1.

5.5.3 Container Compatibility and Segregation

Container compatibility and segregation are described in Section 5.5.3 of the ICDF Complex WAC (DOE-ID 2002a), Table 1-1.

5.5.4 Securing Waste and Shielding

Securing waste and shielding are described in Section 5.5.4 of the ICDF Complex WAC (DOE-ID 2002a), Table 1-1.

5.5.5 Handling Packages

Handling packages are described in Section 5.5.5 of the ICDF Complex WAC (DOE-ID 2002a), Table 1-1.

5.5.6 Minimizing Subsidence

All waste shall be packaged in a form that minimizes settling and subsidence of the ICDF landfill to the maximum extent feasible. The following forms will be considered to meet these criteria.

- Inherently stable waste that will not subside in the disposal environment.
- Waste stabilized by grouting or packaging.
- Containerized soil and soil-like solids and sorbed liquids that fills at least 95% of the volume of the container.
- Other containerized waste that fills at least 95% of the internal volume of the container; void space should be kept to a minimum.
- Any void fillers must be selected and used in accordance with the requirements of this WAC.

5.5.7 Package Labeling and Marking

Package labeling and marking are described in Section 5.5.5 of the ICDF Complex WAC (DOE-ID 2002a).

5.5.8 Vehicle Placarding

Vehicle placarding is described in Section 5.5.7 of the ICDF Complex WAC (DOE-ID 2002a).

5.5.9 Bulk (Noncontainerized) Waste

Labeling of bulk noncontainerized waste is described in Section 5.5.8 of the ICDF Complex WAC (DOE-ID 2002a).

5.5.10 Radiological Contamination Limits

Radiological container limits for waste containers are described in Section 5.5.9 of the ICDF Complex WAC (DOE-ID 2002a).

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